REMARKS

Claims 1-13 remain in the application. Claims 8 and 9 have been withdrawn from consideration.

The Examiner indicated the allowability of claims 2-7 and 10-13 if rewritten in independent form including all the limitations of the base claim and any intervening claims. These claims have been so amended and should now be in condition for allowance.

Claim 1 was rejected under 35 USC 102(e) as being anticipated by Freitag et al. Claim 1 is distinguished over Freitag by reciting:

> "applying a first magnetic field to the hard bias structure for orienting magnetic spins of the hard bias structure in a first direction that is parallel to said ABS and parallel to major thin film planes of layers of the read sensor; and
> applying a second magnetic field to the hard bias structure in a direction that is antiparallel to said first direction."

The first step is shown in Fig. 11 wherein a first magnetic field H_1 is applied to the hard bias structure (components 140 and 144 in Fig. 9) for orienting magnetic spins of the hard bias structure in a first direction that is parallel to the ABS and parallel to major thin film planes of layers of the read sensor. The ABS is shown in the planes of the paper in Figs. 9 and 10 and extends perpendicular into the wafer 200 as shown in Figs. 11 and 12. The second step is shown in Fig. 12 wherein a second magnetic field H_2 is applied to the hard bias structure in a direction that is antiparallel to the first direction H_1. This then causes the free layer structure 204 to be biased in the direction of the arrows 224 in Fig. 10 for stabilizing the magnetic domains of the free layer structure. This is fully supported by Applicants' specification from page 10, line 22 to page 11, line 4 which states:

"Fig. 11 is an isometric illustration of a wafer upon which multiple magnetic head assemblies 40, as shown in Fig. 6, may be fabricated. The magnetic head assemblies may or may not include the write head portion 70 shown in Fig. 6. After fabricating the magnetic head assemblies on the wafer 200 the wafer may be subjected to a magnetic field H_1 which is oriented in a first direction parallel to the ABS and parallel to the major thin film planes of the layers for orienting magnetic moments of the hard bias layers 140 and 144 in the same direction. In one embodiment of the invention a second field H_2 is applied in a direction antiparallel to the direction of the magnetic field H_1 in Fig. 11, as shown in Fig. 12. This switches the magnetic moments of the hard bias layers 140 and 144 in an opposite direction. It has been found that this method improves the magnetic stability of the first and second hard bias layers 140 and 144 which, in turn, improves the predictability of the read amplitude of any one magnetic head assembly or improves the uniformity of read amplitudes of multiple magnetic read head assemblies on a HGA or HSA."

In support of his rejection the Examiner states:

"Freitag et al. teach a process of making a magnetic head assembly including a read sensor comprising steps of: forming a read sensor (74); forming a hard bias structure (140, 144) magnetically coupled to the read sensor for longitudinally biasing the read sensor as shown in Fig. 9; applying a first magnetic field (250) to the hard bias structure for orienting magnetic spins of the hard bias structure in a first direction that is parallel to the ABS and parallel to major thin film planes of layers of the read sensor; and applying a second magnetic field (224) to the hard bias structure in a direction that is antiparallel to the first direction as shown in Fig. 11 (see also col. 5, line 31 to col. 8, line 29)."

The Applicants disagree with the Examiner that the first magnetic field 250 and the second magnetic field 224 are antiparallel with respect to each other as shown in Fig. 11 of Freitag. In contrast, the magnetic fields 250 and 224 are perpendicular with respect to one another. Freitag explains this process in col. 5, line 66 to col. 6, line 6 wherein it is stated:

"The first and second AP pinned layers 214 and 216 of the first AP pinned layer structure have magnetic moments 226 and 228 respectively and the AP pinned layers 220 and 222 of the second AP pinned layer structure have magnetic moments 232 and 234 which can be set in-phase with respect to one another by a second magnetic field 224 applied from a source exterior of the sensor which will be explained in more detail hereinafter. . . . . . "

This process if further described in Freitag from col. 7, line 35 to col. 8, line 21 wherein it is stated:

"Another embodiment of the present spin valve sensor is shown in FIG. 11 which is the same as the spin valve sensor shown in FIG. 10 except each of the first AP pinned layers 214 and 220 has a magnetic thickness which is less than either of the magnetic thicknesses of the second AP pinned layers 216 and 222. Exemplary thicknesses when the material is $Co_{90}Fe_{10}$ is 17 Å of $Co_{90}Fe_{10}$ for each of the first AP pinned layers 214 and 220 and 20 Å of $Co_{90}Fe_{10}$ for each of the second AP pinned layers 216 and 222. Accordingly, when the second magnetic field 224 is exteriorly applied into the sensor the magnetic moments 228 and 234 of the second AP pinned layers are oriented perpendicular to and into the sensor which causes the magnetic moments 226 and 232 of the first AP pinned layers to be oriented antiparallel thereto. Optionally, the second magnetic field 224 may be directed out of the sensor which would reverse the orientations of the magnetic moments of the AP pinned layers. The magnetic thicknesses of each of the first or second AP pinned layers must be greater than the magnetic thicknesses of the second or first AP pinned layers respectively so that the second magnetic field 224 sets the magnetic moments in-phase.

FIGS 12-14 illustrate exemplary methods for setting the magnetic moments of the read heads. In FIG. 12 a wafer 400 is illustrated wherein rows and columns of sliders 402 with magnetic heads 404 has been formed thereon. During formation of the aforementioned AP pinned layers of the AP pinned layer structures a first magnetic field is oriented perpendicular to the air bearing surfaces for setting the easy axes of the AP pinned layers perpendicular to the air bearing surfaces which first magnetic field is preferably applied in the presence of heat, such as 265° C. The strength of the first magnetic field in FIG. 12 may be on the order of 10 kOe. FIG. 13 illustrates a row of sliders and magnetic heads after dicing the row from the rows and columns of sliders and magnetic heads in FIG. 12. In FIG. 13 the row of sliders and magnetic heads 406 is subjected to the aforementioned second magnetic field which orients the magnetic moments of the AP pinned layers of the first and second AP pinned layer structures so that the AP pinned layer structures are in-phase with respect to one another. The strength of the second magnetic field in FIG. 13 may be on the order of 10 kOe. In FIG. 14 the row of sliders and magnetic heads is longitudinally set which means that a third magnetic field is oriented parallel to the air bearing surfaces and parallel to the major planes of the AP pinned layers. The strength of the third magnetic field may be 2-5 Oe. The longitudinal setting sets the magnetic moments of the first and second hard bias layers 140 and 144 in FIG. 9 in a direction parallel to the ABS and parallel to the major planes of the AP pinned layers for longitudinally biasing and magnetically stabilizing the free layer structure within the sensor. It should be understood that the steps shown in FIGS. 13 and 14 may optionally be accomplished at the wafer level, as shown in FIG. 12, or at the slider level 402, as shown in FIG. 15."

It is obvious from Freitag's description and drawings that the magnetic moments 250 and 224 in Fig. 11 are not antiparallel with respect to one another. Accordingly, claim 1 is clearly distinguished over Freitag.

It is further noted that the Freitag application was filed April 18, 2002 whereas Applicants' application was filed January 18, 2002. The Applicants respectfully submit that the Freitag patent is not a valid prior art reference against the present application.

Should the Examiner have any questions regarding this document he is respectfully requested to contact the undersigned.

Respectfully submitted,

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